

REMARKS

This amendment responds to the office action mailed July 27, 2006. In the office action the Examiner:

- rejected claims 1, 2, 21 and 22 under 35 U.S.C. 102(e) as anticipated by Tsunashima et al. (US 2002/0024082 A1); and
- rejected claims 3-10 and 23-30 under 35 U.S.C. 103(a) as being unpatentable over Tsunashima et al. (US 2002/0024082 A1) in view of Cogan et al. (US 4,835,586).

After entry of this amendment, the pending claims are: claims 1-3, 5-10, 21-23, and 25-32. Claims 4 and 24 have been canceled.

Drawing objection under 37 CFR 1.83(a)

Since Applicant has canceled claims 4 and 24, the Examiner's objection to the drawings is moot. Applicant respectfully requests the drawing objection be withdrawn.

Claim Amendments

Applicant has amended claims 1 and 21 to further clarify that a trench wall has at least two different portions. A silicon dioxide layer is disposed on the first portion of the trench wall and a polysilicon fill is disposed on the second portion of the trench wall. Support for the amendments is found in the specification (page 12, line 22 to page 15, line 5 in connection with Figures 2D-2F and 3).

New claims 31 and 32, respectively, recite that the polysilicon fill disposed on the second portion of the trench wall is in contact with a doped region of the silicon substrate. Support for the new claims is found on page 13, lines 9-16 of the specification in connection with Figure 2E.

No new matter is added.

Claim Rejections under 35 U.S.C. 102(b)

The Examiner rejected claims 1, 2, 21, and 22 under 35 U.S.C. 102(b) as being anticipated by Tsunashima. Applicant respectfully traverses.

Figure 1 of Tsunashima depicts that the polysilicon film 8₁ is **entirely** disposed on the capacitor insulating film 7. There is no direct physical contact between the polysilicon film 8₁ and any portion of the trench wall. Actually, as shown in Figure 2E, when the polysilicon film 8₁ is used to fill the trench 3, the entire surface of the substrate 1 (including the entire

wall of the trench 3) is completely covered with the capacitor insulating film 7. Therefore, the polysilicon film 8₁ is electrically insulated from the substrate 1. It is noted that the polysilicon film 8₂ and the polysilicon film 11 are also isolated from the trench wall by films 9 and 10, respectively.

This physical structure is necessary because Tsunashima teaches a DRAM cell structure in which the polysilicon film 8₁, as one capacitor electrode and together with the plate electrode 6, stores a data bit assigned to the DRAM cell. If the polysilicon film 8₁ is in any physical contact with the trench wall, it would have the same potential as the plate electrode 6 and no charge can be stored therein. All the other embodiments disclosed by Tsunashima have the same requirement.

New claims 31 and 32, respectively, further recite that the polysilicon fill disposed on the second portion of the trench wall is in contact with a doped region (e.g., the n⁺ contact surface in Figure 3) of the silicon substrate.

Therefore, claims 1-2, 21-22, and 21-32 are not anticipated by Tsunashima.

Claim Rejections under 35 U.S.C. 103(a)

The Examiner rejected claims 3-10 and 23-30 under 35 U.S.C. 103(a) as being unpatentable over Tsunashima in view of Cogan. Applicant respectfully traverses.

Cogan describes a dual-gate vertical field effect transistor structure. As shown in Figure 1 of Cogan, the polysilicon gate (112a, 112b) is deposited on the insulating layer (110a, 110b) covering the trench wall and it is completely insulated from the substrate 104 in order for the transistor to operate normally.

Since the two references, alone or combined, do not teach or suggest all the features recited in claims 1 and 21 of the present application, claims 3-10 and 23-30 are patentable over Tsunashima in view of Cogan.

In light of the above amendments and remarks, the Applicant respectfully requests that the Examiner reconsider this application with a view towards allowance. The Examiner is invited to call the undersigned attorney at (650) 843-4000, if a telephone call could help resolve any remaining items.

Respectfully submitted,

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